Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application. Please add claims 108-157 as follows:

Listing of Claims:

Claims 1-27 (Canceled).

28. (Previously Presented) An ultrasonic imaging system for producing a three dimensional image of a tissue or fluid inside a body, comprising:

an ultrasound transducer;

an ultrasound transmitter coupled to the ultrasound transducer, the ultrasound transducer being operable to generate a signal having a fundamental frequency;

an ultrasound receiver coupled to the ultrasound transducer, the ultrasound receiver being operable to receive a signal from the ultrasound transducer corresponding to ultrasound reflections from the tissue or fluid at a plurality of depths in the body;

a filter coupled to the ultrasound receiver, the filter being operable to selectively pass signals received by the receiver having a frequency that is a harmonic of the fundamental frequency and to provide an output signal corresponding thereto; and

an image processor coupled to receive the output signal from the filter, the image processor being operable to generate a three dimensional image from the output signal of the filter.

29. (Original) The ultrasonic imaging system of claim 28 wherein the filter is further operable to pass signals at the fundamental frequency so that the output signal is a combination of signals received by the receiver having the fundamental frequency and signals received by the receiver having the harmonic frequency.

30. (Original) The ultrasonic imaging system of claim 29 wherein the filter further comprises:

a low frequency channel operable to pass components of the signals received by the receiver having the fundamental frequency;

a high frequency channel operable to pass components of the signals received by the receiver having the harmonic frequency; and

a combiner operable to combine the signals passed through the low frequency channel and the signals passed through the high frequency channel.

31. (Previously Presented) The ultrasonic imaging system of claim 30 wherein the low frequency channel is further operable to attenuate signals reflected from the tissue or fluid at shallower depths of the body to a greater extent than signals reflected from the tissue or fluid at greater depths of the body, and the high frequency channel is further operable to attenuate signals reflected from the tissue or fluid at greater depths of the body to a greater extent than signals reflected from the tissue or fluid at shallower depths of the body so that deeper portions of the three-dimensional image are produced predominantly from signals received by the receiver having the fundamental frequency and shallower portions of the three-dimensional image are produced predominantly from signals received by the receiver having the harmonic frequency.

32. (Original) The ultrasonic imaging system of claim 31 wherein the high frequency channel includes a depth-dependent time varying filter to attenuate signals passing through the channel as a function of depth of the body.

33. (Previously Presented) The ultrasonic imaging system of claim 28 wherein the ultrasonic imaging system is adapted to generate the three dimensional image is generated in the absence of an ultrasound contrast agent.

34. (Previously Presented) the ultrasound imaging system of claim 30 wherein the combiner comprises a switch operable to couple the low-frequency channel to the image processor responsive to a signal corresponding to ultrasound reflections from ultrasound reflectors in a first range of depths and operable to couple the high frequency channel to the image processor responsive to a signal corresponding to ultrasound reflections from ultrasound

reflectors in a second range of depths, the second range of depths being different from the first range of depths.

35. (Original) The ultrasound imaging system of claim 30 wherein the combiner comprises a summing device operable to generate a composite signal formed from both a fundamental frequency signal coupled through the low frequency channel and a harmonic frequency signal coupled through the high frequency channel.

36. (Previously Presented) The ultrasound imaging system of claim 28 further comprising a Doppler processor coupling the image processor to the filter, the Doppler processor being operable to generate a Doppler signal from the output signal of the filter, the Doppler signal being applied to the image processor so that the three dimensional image corresponds to ultrasound reflections from moving tissue or fluid .

37. (Previously Presented) The ultrasound imaging system of claim 36 wherein the Doppler signal is indicative of the velocity of the moving tissue or fluid .

38. (Previously Presented) The ultrasound imaging system of claim 36 wherein the Doppler signal is indicative of the intensity of reflections from the moving tissue or fluid.

39. (Original) The ultrasound imaging system of claim 28 wherein the filter is further operable to shift the frequency of the signals received by the receiver having the harmonic to a different frequency.

40. (Original) The ultrasound imaging system of claim 28 wherein the filter comprises a finite impulse response filter operable to filter and decimate the signals received by the receiver.

41. (Original) The ultrasound imaging system of claim 28 wherein the transmitter is operable to generate first and second successive pulses of signals at the

fundamental frequency having different phases, and wherein the filter comprises a signal processor operable to combine a first signal received from the receiver resulting from the first successive pulse with a second signal received from the receiver resulting from the second successive pulse.

42. (Original) The ultrasound imaging system of claim 28 wherein the signal generated by the ultrasound transmitter has a range of frequency components, the range of frequency components including the fundamental frequency.

43. (Previously Presented) An ultrasonic imaging system for producing a three dimensional image of a tissue or fluid inside a body, comprising:

an ultrasonic transducer operable to transmit ultrasonic pulses into a body and receive echo signals responsive to the pulses, the ultrasonic pulses having a fundamental frequency component;

a beamformer coupled to receive the echo signals from the ultrasonic transducer and to generate output signals corresponding thereto;

a filter coupled to receive the output signals from the beamformer, the filter being operable to selectively pass harmonic frequency components of the beamformer output signals that are a harmonic of the fundamental frequency component; and

an image processor coupled to the filter to receive the harmonic frequency components of the beamformer output signals, the image processor being operable to generate a three dimensional image from the harmonic frequency components of the beamformer output signals.

44. (Original) The ultrasonic imaging system of claim 43 wherein the filter comprises a digital filter.

45. (Original) The ultrasonic imaging system of claim 43 wherein the filter is further operable to pass fundamental frequency components of the beamformer output signals so that the image is formed from fundamental and harmonic frequency components of the beamformer output signals.

46. (Original) The ultrasonic imaging system of claim 45 wherein the filter comprises:

a low frequency channel operable to pass the fundamental frequency components;

a high frequency channel operable to pass the harmonic frequency components; and

a combiner operable to combine the fundamental frequency components with the harmonic frequency components.

47. (Previously Presented) The ultrasonic imaging system of claim 46 wherein the low frequency channel is further operable to attenuate signals reflected from the tissue or fluid at shallower depths of the body to a greater extent than signals reflected from the tissue or fluid at greater depths of the body, and the high frequency channel is further operable to attenuate signals reflected from the tissue or fluid at greater depths of the body to a greater extent than signals reflected from the tissue or fluid at shallower depths of the body so that deeper portions of the three-dimensional image are produced predominantly from the fundamental frequency components and shallower portions of the 3-dimensional image are produced predominantly from the harmonic frequency components.

48. (Original) The ultrasonic imaging system of claim 46 wherein the high frequency channel each includes a depth-dependent time varying filter to attenuate signals passing through the channel as a function of the depth from which the echo signals are received.

49. (Previously Presented) The ultrasonic imaging system of claim 46 wherein the low frequency channel is operable to attenuate signals reflected from the tissue or fluid at a first range of depths to a greater extent than signals reflected from the tissue or fluid at a second range of depths, and to attenuate signals reflected from the tissue or fluid at the second range of depths to a greater extent than signals reflected from the tissue or fluid at a third range of depths, and wherein the high frequency channel is operable to attenuate signals reflected from the tissue or fluid at the third range of depths to a greater extent than signals reflected from the tissue or fluid at the second range of depths, and to attenuate signals reflected from the tissue or

fluid at the second range of depths to a greater extent than signals reflected from the tissue or fluid at the first range of depths, the third range of depths being deeper than the second range of depths, and the second range of depths being deeper than the first range of depths so that portions of the three-dimensional image in the third range of depths are produced predominantly from the fundamental frequency component, portions of the three-dimensional image in the first range of depths of the body are produced predominantly from the harmonic frequency component, and portions of the three-dimensional image in the second range of depths are produced substantially equally from the fundamental frequency component and the harmonic frequency component.

50. (Original) The ultrasonic imaging system of claim 46 wherein the combiner comprises a switch operable to alternatively couple either the low frequency channel or the high frequency channel to the image processor.

51. (Original) The ultrasonic imaging system of claim 46 wherein the combiner comprises a summing device operable to generate a composite signal formed from both the fundamental frequency component coupled through the low frequency channel and the harmonic frequency component coupled through the high frequency channel.

52. (Previously Presented) The ultrasonic imaging system of claim 43 further comprising a Doppler processor coupling the image processor to the filter, the Doppler processor being operable to generate a Doppler signal from the harmonic frequency component, the Doppler signal being applied to the image processor so that the three dimensional image corresponds to ultrasound reflections from moving tissue or fluid.

53. (Previously Presented) The ultrasonic imaging system of claim 52 wherein the Doppler signal is indicative of the velocity of the moving tissue or fluid.

54. (Previously Presented) The ultrasonic imaging system of claim 52 wherein the Doppler signal is indicative of the intensity of reflections from the moving tissue or fluid.

55. (Original) The ultrasonic imaging system of claim 43 wherein the filter is further operable to shift the frequency of the harmonic frequency component.

56. (Original) The ultrasonic imaging system of claim 43 wherein the filter comprises a finite impulse response filter operable to filter and decimate the beamformer output signals.

57. (Original) The ultrasonic imaging system of claim 43 wherein the ultrasonic pulses comprise first and second successive pulses of signals having the fundamental frequency component, the first and second pulses having different phases, and wherein the filter comprises a signal processor operable to combine a first output signal from the beamformer derived from an echo signal responsive to the first successive pulse with a second signal from the beamformer derived from an echo signal responsive to the second successive pulse.

58. (Original) The ultrasonic imaging system of claim 43 wherein each of the ultrasonic pulses transmitted into the body have a range of frequency components, the range of frequency components including the fundamental frequency component.

59-70. (Canceled)

71. (Previously Presented) A method of generating a three-dimensional image of a tissue or fluid inside a body, comprising:

transmitting an ultrasound signal into the body, the ultrasound signal having at least a fundamental frequency;

detecting echoes of the transmitted ultrasound signal at a harmonic frequency that is a multiple of the fundamental frequency; and

using the detected echoes to form the three-dimensional image of a tissue or fluid in the body.

72. (Previously Presented) the method of claim 71, further comprising, prior to transmitting the ultrasound signal, introducing a contrast agent into the body so that at least

some of the detected echoes of the transmitted ultrasound signal comprises reflections from the contrast agent.

73. (Previously Presented) The method of claim 71, further comprising:

detecting echoes of the transmitted ultrasound signal at the fundamental frequency; and

using the detected echoes at both the fundamental frequency and the harmonic frequency to form the three-dimensional image.

74. (Previously Presented) The method of claim 73 wherein the detected echoes at the fundamental frequency are used to form the three-dimensional image alternately with the use of the detected echoes at the harmonic frequency to form the three-dimensional image.

75. (Previously Presented) The method of claim 73 wherein the detected echoes at the fundamental frequency and the detected echoes at the harmonic frequency are used simultaneously to form the three-dimensional image.

76. (Previously Presented) The method of claim 73 wherein the detected echoes at the fundamental frequency are used to form portions of the three-dimensional image that are at a greater depth within the body, and the detected echoes at the harmonic frequency are used to form portions of the three-dimensional image that are at a shallower depth within the body.

77. (Previously Presented) The method of claim 73 wherein the detected echoes at the fundamental frequency are used to form portions of the three-dimensional image that are at a greater depth within the body, the detected echoes at the harmonic frequency are used to form portions of the three-dimensional image that are at a shallower depth within the body, and both the detected echoes at the fundamental frequency and the detected echoes at the harmonic frequency are used to form portions of the three-dimensional image that are at an intermediate depth within the body.

78. (Previously Presented) The method of claim 71 wherein the act of detecting echoes of the transmitted ultrasound signal comprises detecting echoes from moving tissue or fluid within the body.

79. (Previously Presented) The method of claim 78 wherein the act of using the detected echoes to form a three-dimensional image comprise displaying the three-dimensional image with indicia indicative of the velocity of the moving tissue or fluid.

80. (Previously Presented) The method of claim 78 wherein the act of using the detected echoes to form a three-dimensional image comprise displaying the three-dimensional image with indicia indicative of the intensity of the echoes reflected from the moving tissue or fluid.

81. (Original) The method of claim 71 wherein the act of transmitting an ultrasound signal into the body comprises transmitting an ultrasound signal into the body having a range of frequency components, the range of frequency components including the fundamental frequency.

82. (Previously Presented) A method of producing a three-dimensional ultrasonic image of a tissue or fluid in the body, comprising:

transmitting ultrasonic signals into the body, the transmitted ultrasonic signals having a fundamental frequency component;

receiving ultrasonic echoes from tissue or fluid within the body, the received ultrasonic echoes including a frequency component that is a harmonic of the fundamental frequency component;

storing signals derived from the harmonic frequency component of the received ultrasonic echoes; and

displaying a three-dimensional image of a tissue or fluid in the body from the stored signals.

83. (Previously Presented) the method of claim 82, further comprising, prior to transmitting the ultrasound signal, introducing a contrast agent into the body so that at least some of the ultrasound reflectors from which the ultrasonic echoes are received comprise the contrast agent.

84. (Previously Presented) The method of claim 82 wherein the act of receiving echoes from tissue or fluid within the body comprises receiving echoes from moving tissue or fluid within the body.

85. (Canceled).

86. (Previously Presented) The method of claim 84 wherein the act of displaying a three-dimensional image from the stored signals comprises displaying a three-dimensional image from the stored signals containing information indicative of the velocity of the moving tissue or fluid.

87. (Previously Presented) The method of claim 84 wherein the act of displaying a three-dimensional image from the stored signals comprises displaying a three-dimensional image from the stored signals containing information indicative of the intensity of the echoes reflected from the moving tissue or fluid.

88. (Original) The method of claim 82 wherein the act of transmitting ultrasonic signals into the body comprises transmitting ultrasonic signals having a range of frequency components, the range of frequency components including the fundamental frequency component.

89. (Previously Presented) A method of producing a three-dimensional ultrasonic image of a tissue or fluid in the body, comprising:

transmitting ultrasonic signals into the body, the transmitted ultrasonic signals having a fundamental frequency component;

receiving ultrasonic echoes from tissue or fluid within the body, the received ultrasonic echoes containing both fundamental and harmonic frequency components;

detecting the fundamental and harmonic frequency components of the ultrasonic echoes;

forming signals that are a blend of the detected fundamental and harmonic frequency components;

storing the formed signals; and

displaying a three-dimensional image of a tissue or fluid in the body from the stored signals.

90. (Previously Presented) The method of claim 89, wherein the forming of signals that are a blend of the detected fundamental and harmonic frequency components comprises forming a blend of the detected fundamental and harmonic frequency components that varies as a function of time.

91. (Previously Presented) The method of claim 89, wherein the forming of signals that are a blend of the detected fundamental and harmonic frequency components comprises forming a blend of the detected fundamental and harmonic frequency components that varies as a function of the depth of the tissue or fluid from which the reflections are received.

92. (Previously Presented) The method of claim 89, wherein the forming of signals that are a blend of the detected fundamental and harmonic frequency components comprises forming a blend of the detected fundamental and harmonic frequency components that varies as a function of the location of the tissue or fluid from which the reflections are received.

93. (Previously Presented) the method of claim 89, further comprising, prior to transmitting the ultrasound signal, introducing a contrast agent into the body so that at least some of the ultrasound reflectors from which the ultrasonic echoes are received comprise the contrast agent.

94. (Canceled).

95. (Previously Presented) The method of claim 89 wherein the act of receiving echoes from tissue or fluid within the body comprises receiving echoes from moving tissue or fluid within the body.

96. (Previously Presented) The method of claim 95 wherein the act of displaying a three-dimensional image from the stored signals comprises displaying a three-dimensional image from the stored signals containing information indicative of the velocity of the moving tissue or fluid.

97. (Previously Presented) The method of claim 95 wherein the act of displaying a three-dimensional image from the stored signals comprises displaying a three-dimensional image from the stored signals containing information indicative of the intensity of the echoes reflected from the moving tissue or fluid.

98. (Original) The method of claim 89 wherein the act of transmitting ultrasonic signals into the body comprises transmitting ultrasonic signals having a range of frequency components, the range of frequency components including the fundamental frequency component.

99. (Previously Presented) The method of claim 89 wherein the detected fundamental frequency component and the detected harmonic frequency component are alternately used to form the three-dimensional image.

100. (Previously Presented) The method of claim 89 wherein the detected fundamental frequency component and the detected harmonic frequency component are simultaneously used to form the three-dimensional image.

101. (Previously Presented) The method of claim 89 wherein the detected fundamental frequency component is used to form portions of the three-dimensional image that

are at a greater depth within the body, and the detected harmonic frequency component is used to form portions of the three-dimensional image that are at a shallower depth within the body.

102. (Previously Presented) The method of claim 89 wherein the detected fundamental frequency component is used to form portions of the three-dimensional image that are at a greater depth within the body, the detected harmonic frequency component is used to form portions of the three-dimensional image that are at a shallower depth within the body, and both the detected fundamental frequency component and the detected harmonic frequency component are used to form portions of the three-dimensional image that are at an intermediate depth within the body.

103. (Original) A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) filtering from said echo information a plurality of information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band; and

(d) forming the three-dimensional reconstruction in response to said information signals.

104. (Original) An ultrasound apparatus adapted for generating a three dimensional reconstruction of a subject during an imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session, said apparatus comprising:

a transducer;

a transmit beamformer operatively connected to said transducer for transmitting ultrasonic energy into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

a receive beamformer operatively connected to said transducer and configured to obtain echo information;

a filter operatively connected to said receive beamformer and operative to filter from said echo information a plurality of information signals associated with a harmonic frequency band, said harmonic frequency band comprising harmonics of a fundamental frequency band transmitted into the subject; and

wherein the three-dimensional reconstruction is responsive to said information signals.

105. (Original) A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a plurality of detected Doppler information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band;

(d) forming the three-dimensional reconstruction in response to said information signals; and

(e) displaying a Doppler image selected from the group of: velocity, variance, energy and combinations thereof, the Doppler image being responsive to said three dimensional reconstruction.

106. (Original) A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session, said ultrasonic energy characterized by a peak power level near said first frequency band;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a plurality of information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band, and a second plurality of information signals associated with said first frequency band;

(d) forming the three-dimensional reconstruction in response to said information signals; and

(e) displaying a composite image responsive to said three dimensional reconstruction and representing three dimensions, said composite image comprising spatially distinct near-field and far-field regions, said far-field region emphasizing information signals in the first frequency band and said near-field region emphasizing information signals in the second frequency band.

107. (Original) A method for producing a three dimensional reconstruction with an ultrasound system, the method comprising the steps of:

(a) transmitting ultrasonic energy at a first frequency band into a subject during said imaging session, said subject being free of added ultrasound contrast agent throughout the entire imaging session;

(b) receiving ultrasonic echo information associated with said transmitted ultrasonic energy;

(c) obtaining from said echo information a first plurality of information signals associated with said first frequency band and a second plurality of information signals associated with a second frequency band, said second frequency band comprising at least a harmonic band of said first frequency band;

(d) compounding the first and second plurality of information signals; and

(e) forming the three-dimensional reconstruction as a function of said compounded information signals.

108. (New) A method of imaging a biological sample, comprising the steps of:

generating a transmit ultrasonic signal at a fundamental frequency;

directing the transmit signal into and along a propagation path in the sample, wherein the sample distorts the transmit signal along the propagation path and thereby produces a distorted ultrasonic signal including harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the distorted ultrasonic signal including said harmonic components;

receiving the harmonic components of the reflected distorted ultrasonic signal;

digitizing the received signal;

using a processor to process the digitized signal to produce an image principally from one of the received harmonic components of the reflected distorted ultrasonic signal; and

displaying said produced image.

109. (New) A method according to claim 108, wherein the sample has a near field and a focal plane, and wherein the amplitude of the second harmonic component of the distorted ultrasonic signal exhibits a relatively large gain in growth from low near field values to significant focal plane amplitudes.

110. (New) A method according to claim 109, wherein the sample has a source plane, and as the transmit signal propagates to the focal plane, the amplitude of said second harmonic component of the produced, distorted signal at half the distance between the source and focal planes is about twice the amplitude of said second harmonic component at the source plane.

111. (New) A method according to claim 110, further comprising the step of high pass filtering the received harmonic components of the reflected, distorted ultrasonic signal.

112. (New) A method according to claim 111, wherein the high pass filtering step occurs before the digitizing step.

113. (New) A method according to claim 108, wherein said sample causes defocusing effects in said near field, and because of said relatively large gain in growth of the amplitude of the second harmonic component between the near field and the focal plane, only a fraction of said second harmonic component is defocused by said near field defocusing effects.

114. (New) A method according to claim 108, wherein:

the generating step includes the step of using a phased array transducer-receiver unit to generate the transmit signal; and

the directing step includes the steps of:

i) using the transducer-receiver unit to focus the transmit signal on a focal point in the sample, and

ii) using electrical circuitry in the transducer-receiver unit to move the focal point around the sample.

115. (New) A method of imaging a biological sample, comprising the steps of:

generating first and second ultrasonic transmit pulse signals at a fundamental frequency;

directing the first and second pulse signals into and along a propagation path in the sample, wherein the sample distorts the first and second pulse signals along the propagation path and thereby produces, respectively, first and second distorted ultrasonic signals including harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the first and second distorted ultrasonic signals including said harmonic components therein;

receiving the harmonic components of the reflected first and second distorted ultrasonic signals; digitizing the received first and second signals;

scaling the digital values obtained from the first signal; subtracting the scaled digital values obtained from the first signal from the second signal to produce a resultant signal;

using a processor to process said resultant signal to produce an image principally from the received harmonic components of the reflected distorted ultrasonic signals; and

displaying said produced image.

116. (New) A method according to claim 115, wherein the resultant signal is high pass filtered and transformed to a time domain to obtain an on-axis distortion imaging pulse.

117. (New) A method according to claim 115, wherein the sample has a near field and a focal plane, and wherein the amplitudes of the second harmonic components of the distorted ultrasonic signals exhibit relatively large gains in growth from low near field values to significant focal plane amplitudes.

118. (New) A method according to claim 117, wherein the sample has a source plane, and as the transmit pulse signals propagate to the focal plane, the amplitudes of said second harmonic components of the produced, distorted signals at half the distance between the source and focal planes is about twice the amplitudes of said second harmonic components at the source plane.

119. (New) A method according to claim 117, wherein said sample causes defocusing effects in said near field, and because of said relatively large gains in growth of the amplitudes of the second harmonic components between the near field and the focal plane, only a fraction of said second harmonic components are defocused by said near field defocusing effects.

120. (New) A method according to claim 115, wherein: the generating step includes the step of using a phased array transducer-receiver unit to generate the transmit signals; and the directing step includes the steps of: i) using the transducer-receiver unit to focus the transmit signals on a focal point in the sample; and ii) using electrical circuitry in the transducer-receiver unit to move the focal point around the sample.

121. (New) A system for imaging a biological sample, comprising:

means for generating a transmit ultrasonic signal at a fundamental frequency;

means for directing the transmit signal into and along a propagation path in the sample, wherein the sample distorts the transmit signal along the propagation path and thereby produces a distorted ultrasonic signal including harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the distorted ultrasonic signal including said harmonic components;

means for receiving the harmonic components of the reflected distorted ultrasonic signal;

an analog-to-digital converter for digitizing the received signal;

a processor to process the digitized signal to produce an image principally from one of the received harmonic components of the reflected distorted ultrasonic signal; and

means for displaying said formed image.

122. (New) A system according to claim 121, wherein the sample has a near field and a focal plane, and wherein the amplitude of the second harmonic component of the distorted ultrasonic signal exhibits a relatively large gain in growth from low near field values to significant focal plane amplitudes.

123. (New) A system according to claim 122, wherein the sample has a source plane, and as the transmit signal propagates to the focal plane, the amplitude of said second harmonic component of the produced, distorted signal at half the distance between the source and focal planes is about twice the amplitude of said second harmonic component at the source plane.

124. (New) A system according to claim 123, wherein said sample causes defocusing effects in said near field, and because of said relatively large gain in growth of the amplitude of the second harmonic component between the near field and the focal plane, only a fraction of said second harmonic component is defocused by said near field defocusing effects.

125. (New) A system according to claim 121, wherein reflected distorted signal also includes frequency components of the fundamental frequency, and further comprising

a high pass filter to remove from the received signal the component thereof at the fundamental frequency.

126. (New) A system according to claim 121, wherein:

the generating means includes a phased array transducer-receiver unit to generate the transmit signal; and

the transducer-receiver unit focuses the transmit signal on a focal point in the sample, and includes electrical circuitry to move the focal point around the sample.

127. (New) A system for imaging a biological sample, comprising:

means for generating first and second ultrasonic transmit pulse signals at a fundamental frequency;

means for directing the first and second pulse signals into and along a propagation path in the sample, wherein the sample distorts the first and second pulse signals along the propagation path and thereby produces, respectively, first and second distorted ultrasonic signals including harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the first and second distorted ultrasonic signals including said harmonic components therein;

means for receiving the harmonic components of the reflected first and second distorted ultrasonic signals;

an analog-to-digital converter for digitizing the received first and second signals;

processor means for scaling the digital values obtained from the first signal, subtracting the scaled digital values obtained from the first signal from the second signal to produce a resultant signal, and to process said resultant signal to produce an image principally from the received harmonic components of the reflected distorted ultrasonic signals; and

means for displaying said formed image.

128. (New) A system according to claim 127, wherein the processor means includes a high pass filter to filter the resultant signal, and the processor means transforms the resultant signal to a time domain to obtain an on-axis distortion imaging pulse.

129. (New) A system according to claim 127, wherein the sample has a near field and a focal plane, and wherein the amplitudes of the second harmonic components of the distorted ultrasonic signals exhibit relatively large gains in growth from low near field values to significant focal plane amplitudes.

130. (New) A system according to claim 129, wherein the sample has a source plane, and as the transmit pulse signals propagate to the focal plane, the amplitudes of said second harmonic components of the produced, distorted signals at half the distance between the source and focal planes is about twice the amplitudes of said second harmonic components at the source plane.

131. (New) A system according to claim 129, wherein said sample causes defocusing effects in said near field, and because of said relatively large gains in growth of the amplitudes of the second harmonic components between the near field and the focal plane, only a fraction of said second harmonic components are defocused by said near field defocusing effects.

132. (New) A system according to claim 127, wherein:

the generating means includes a phased array transducer-receiver unit to generate the transmit signals; and

the transducer-receiver unit focuses the transmit signals on a focal point in the sample, and includes electrical circuitry to move the focal point around the sample.

133. (New) A method of imaging a biological sample, comprising the steps of:

generating an initial ultrasonic signal; directing the ultrasonic signal into and along a propagation path in the sample, wherein the sample causes finite, non-linear amplitude distortion of the ultrasonic signal along the propagation path and thereby produces a distorted ultrasonic signal comprised of a first order component signal and higher order harmonic component signals at a first and higher order harmonic frequencies respectively, and further wherein the sample also reflects the distorted ultrasonic signal including the first order and the higher order harmonic components;

receiving the higher order harmonic components of the reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal along the propagation path and caused by said sample;

forming an image principally from one of said received higher order harmonic components of the reflected distorted ultrasonic signal; and

displaying said formed image.

134. (New) A method according to claim 133 wherein:

the generating signal includes the steps of generating first and second ultrasonic signals;

the directing step includes the steps of directing the first and second ultrasonic signals into the sample;

the receiving step includes the step of receiving any first and second signals reflected and distorted by said sample;

the forming step includes the steps of i) subtracting the received second distorted signal from the received first distorted signal to produce a resultant signal, and ii) forming the image from said resultant signal.

135. (New) An ultrasound tissue harmonic imaging method, comprising the steps of:

providing a biological tissue sample;

generating a transmit ultrasonic signal at a fundamental frequency;

transmitting the ultrasound signal into and along a propagation path in the sample, wherein the tissue distorts the transmit ultrasonic signal along the propagation path and thereby produces a distorted ultrasonic signal including harmonic components at second and higher order harmonic frequencies to the fundamental frequency, and further wherein the sample also reflects and scatters the distorted ultrasonic signal including said harmonic components; receiving the harmonic components of the reflected or scattered distorted ultrasonic signal;

using a band pass filter to filter the received harmonic components to enhance the relative signal strength of one or more of the received harmonic components;

producing an ultrasound image of the biological tissue sample from said one or more of the received harmonic components; and

displaying the produced ultrasound image of the biological tissue sample.

136. (New) An ultrasound tissue harmonic imaging method according to claim 135, wherein the band pass filter is a high pass filter to filter the received harmonic components.

137. (New) An ultrasound tissue harmonic imaging method according to claim 135, wherein the band pass filter is a notched filter centered at the second harmonic component so as to receive primarily the second harmonic component.

138. (New) An ultrasound tissue harmonic imaging method according to claim 135, wherein said one of the received harmonic components is the second harmonic component.

139. (New) An ultrasound tissue harmonic imaging method according to claim 135, wherein the band pass filter selects the harmonic components and removes the fundamental component.

140. (New) An ultrasound tissue harmonic imaging system for imaging a biological tissue sample, comprising:

means for generating a transmit ultrasonic signal at a fundamental frequency and transmitting the signal into and along a propagation path in the sample, wherein the sample distorts the transmit signal along the propagation path and thereby produces a distorted ultrasonic signal including harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects or scatters the distorted ultrasonic signal including said harmonic components; means for receiving the harmonic components of the reflected distorted ultrasonic signal;

a band pass filter for filtering the received harmonic components to enhance the relative strength of one or more of the received harmonic components;

means for producing an image of the biological tissue sample from said one or more of the received harmonic components; and

means for displaying the produced image.

141. (New) An ultrasound tissue harmonic imaging system according to claim 140, wherein the band pass filter is a high pass filter to filter the received harmonic component.

142. (New) An ultrasound tissue harmonic imaging system according to claim 140, wherein the band pass filter is a notched filter centered at the second harmonic component so as to receive primarily the second harmonic component.

143. (New) An ultrasound tissue harmonic imaging system according to claim 140, wherein said one of the received harmonic components is the second harmonic component.

144. (New) A system according to claim 140, wherein the band pass filter selects the harmonic components and removes the fundamental component.

145. (New) A method for reducing speckle in an ultrasound tissue image, comprising the steps of:

providing a biological tissue sample; generating a transmit ultrasonic signal at a fundamental frequency;

directing the transmit signal into and along a propagation path in the sample, wherein the tissue distorts the transmit signal along the propagation path and thereby produces a distorted ultrasonic signal including a fundamental component at the fundamental frequency and harmonic components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the distorted ultrasonic signal including said fundamental and harmonic components;

receiving the fundamental component and the harmonic components of the reflected distorted ultrasonic signal;

forming an ultrasound image of the biological tissue sample using two or more of the received components to reduce speckle in the image; and

displaying the formed image.

146. (New) A method for reducing speckle in an ultrasound tissue harmonic image according to claim 145, further comprising the step of filtering the received components to enhance the relative strength of one or more of the received components.

147. (New) A method for reducing speckle in an ultrasound tissue harmonic image according to claim 145, wherein:

the forming step includes the step of forming the image from the sum of the fundamental component and one or more of the harmonic components of the received distorted ultrasonic signal.

148. (New) A method for reducing speckle in an ultrasound tissue harmonic image according to claim 147, wherein the speckle pattern of said one or more of the harmonic components of the received signal is out of phase with the speckle pattern of said fundamental component of the received signal.

149. (New) A method for reducing speckle in an ultrasound tissue harmonic image according to claim 148, wherein said one or more of the harmonic components is the second harmonic component of the received signal.

150. (New) A method for reducing speckle in an ultrasound tissue harmonic image according to claim 149, wherein:

each of the second harmonic component of the received signal and the fundamental component of the received signal has a respective mainlobe; and

the second harmonic component and the fundamental component of the received signal have a largely constant phase relationship in their mainlobes.

151. (New) A system for reducing speckle in an ultrasound tissue harmonic image of a biological tissue sample, comprising:

means for generating a transmit ultrasonic signal at a fundamental frequency and for directing the transmit signal into and along a propagation path in the sample, wherein the sample distorts the transmit signal along the propagation path and thereby produces a distorted ultrasonic signal including fundamental component at a fundamental frequency and harmonic

components at second and higher order harmonic frequencies of the fundamental frequency, and further wherein the sample also reflects the distorted ultrasonic signal including said fundamental and harmonic components;

means for receiving the fundamental and harmonic components of the reflected distorted ultrasonic signal;

means for forming an ultrasound image of the biological tissue sample using two or more of the received components to reduce speckle in the image; and

means for displaying the formed image.

152. (New) A system for reducing speckle in an ultrasound tissue harmonic image according to claim 151, further comprising means for filtering the received components to enhance the relative strength of one or more of the received components.

153. (New) A system for reducing speckle in an ultrasound tissue harmonic image according to claim 151, wherein:

the forming means includes means for forming the image from the sum of the fundamental component and one or more of the harmonic components of the received distorted ultrasonic signal.

154. (New) A system for reducing speckle in an ultrasound tissue harmonic image according to claim 153, wherein the speckle pattern of said one or more of the harmonic components of the received signal is out of phase with the speckle pattern of said fundamental component of the received signal.

155. (New) A system for reducing speckle in an ultrasound tissue harmonic image according to claim 153, wherein said one or more of the harmonic components is the second harmonic component of the received signal.

156. (New) A system for reducing speckle in a tissue harmonic image according to claim 155, wherein:

each of the second harmonic component of the received signal and the fundamental component of the received signal has a respective mainlobe; and

the second harmonic component and the fundamental component of the received signal have a largely constant phase relationship in their mainlobes.

157. (New) A method of imaging a biological sample, comprising the steps of:

generating an initial ultrasonic signal;

directing the ultrasonic signal into and along a propagation path in the sample, wherein the sample causes finite, non-linear amplitude distortion of the ultrasonic signal along the propagation path and thereby produces a distorted ultrasonic signal comprised of a first order component signal and higher order harmonic component signals at a first and higher order harmonic frequencies respectively, and further wherein the sample also reflects the distorted ultrasonic signal including the first order and the higher order harmonic components;

receiving the higher order harmonic components of the reflected distorted ultrasonic signal produced by the distortion of the initial ultrasonic signal along the propagation path and caused by said sample;

forming an image principally from one of said received higher order harmonic components of the reflected distorted ultrasonic signal; and

displaying said formed image.